PRESYS®

Digital Multi-Point Indicator Energy DMY-2015-PB

PROFIBUS®

TECHNICAL MANUAL

CAUTION!

In case of failure, the instrument can provide AC voltage levels in its metal box, which for safety reasons must always be connected to an effective ground point. To this end a suitable terminal is provided on the back of the box identified as GND. Never connect this terminal to the neutral terminal of power supply.

It is recommended the use of an external fuse (2 A) on the power input of the instrument. There is an internal fuse.

Operation of relays - Important Note!

When the instrument has relay module for alarm or control, you must follow the instructions in this manual in the maintenance section on the snubber use.

The snubber is a protection against noise coming from the opening / closing of the relay contacts, but depending on the application may be necessary to remove this snubber!

CAUTION!

The instrument described in this manual is a device for use in specialized technical area. The user is responsible for configuration and selection of values of the instrument parameters. The manufacturer warns of the risks of occurrences with damage to both the person and the property resulting from the incorrect use of the instrument. The information and specifications in this manual are subject to change without previous notice.

Table of Contents

1.0 - Introduction

1.1 - Description

PRESYS Digital Multi-Point Indicator DMY-2015-PB-Energy is ideal for security applications in turbines, hydroelectric plants and thermoelectric generators. It is a microprocessor-based instrument with up to 8 inputs for monitoring RTD sensors. It has non-volatile internal memory (E2PROM) to store calibration values. Its accuracy is warranted by autocalibration techniques based on a high thermal stability voltage reference.

It is able to communicate in a Profibus-DP-V0 network.

RTD inputs are linearized automatically by tables stored in the EPROM memory. All configuration data can be protected by password and are stored in non-volatile memory in case of an external power failure.

Designed within the concept of modularity, the indicator supports up to 2 output cards for alarm. The output types can be: SPDT relay, solid state relay and open collector voltage. In case of sensor break, the trip alarms are not triggered (configurable for both relays). In addition to the high and low alarms, you can set the indicator for failure alarms (Watchdog) triggered by detecting the sensor breaks connected to the inputs.

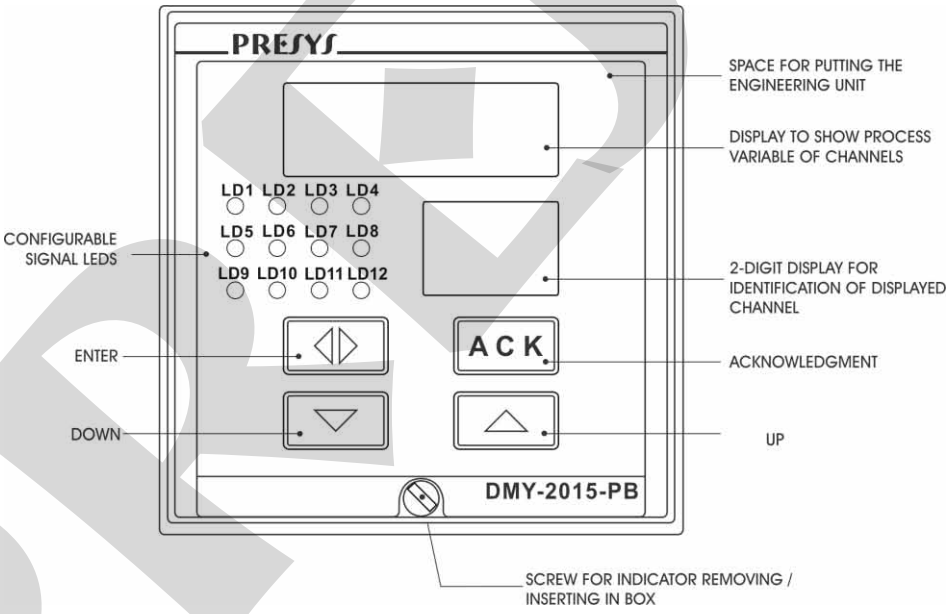


Fig.1 - DMY-2015-PB-Energy Indicator front panel

It allows the use of a universal power supply from 75 to 264 Vac 50/60Hz or 100 to 360 Vdc (any polarity).

The instrument has an extruded aluminum case which makes it highly immune to electrical noise, electromagnetic interference and resistant to the most severe conditions of industrial usage.

The front panel has a high visibility display configurable up to 4 digits which can show the process variable of each channel or a set of selected channels in the scan mode. During configuration, the display shows mnemonics and parameter values. The

Indicator also presents another two-digit display for identification of the channel viewed. The leds can be used as a visual indication of alarm for each channel.

The alarm outputs can be configured, independently, to operate with retention, demanding the operator acknowledge by means of the front panel keys in order to deactivate them after the process variable returns to normal condition.

1.2 - Order Code

DMY-2015-PB - 1 (A) - ____ (B) - ____ (C) - ____ (D) - ____ (E) - ____ (F) - E (G)

Field A	Inputs
1	8 RTD inputs
Field B	Output 3
0	Not used
1	SPDT Relay
2	Open collector voltage
3	Solid State Relay
Field C	Output 4
	Same code as output 3
Field D	Power Supply
1	75 to 264 Vac 50/60Hz or 100 to 360 Vdc (any polarity)
2	24 Vac or 24 Vdc (±10 %)
3	12 Vdc (±10 %)
Field E	Communication
4	Profibus DP-V0
Field F	Case Protection Grade
0	General usage, sheltered place
1	Front aspersion-proof
2	Weather-proof
3	Explosion-proof (BR-Ex d IIB T6 Gb IP 66) horizontal display(*)

(*) Explosion proof box:
Dimensions: 310x310x200 mm (HxWxD)
Weight: 11kg nominal

Field G	Application
E	Energy

Note 1 - The indication, relay usage as alarms and alarm points are, among other things, items that the user can program through a front key (if wanted, specify these information so that all the configuration can be made by PRESYS).

Note 2 - Hardware and software features are available under previous consult.

Code Example:

1) DMY-2015 - PB - 1 - 1 - 1 - 1 - 4 - 0 - E
This code defines an indicator DMY-2015-PB-Energy for 8 RTD inputs with two SPDT relays which can be used as high, low and failure alarm (sensor break alarm), 75 to 264 Vac 50/60Hz or 100 to 360 Vdc electric power supply, for use in a sheltered place. The trip function is configurable for both relays. It has communication Profibus DP-V0.

1.3 - Technical Specifications

Inputs:

- Pt-100 RTD inputs under DIN 43760

Table 1 shows the temperature ranges for RTD

Input sensor	Range			
	°F		°C	
RTD 2 or 3-wire Pt-100	-346.0	752.0	-210.0	400.0*

(*) includes wire resistance

Table 1 - Measuring ranges for input sensors

Outputs:

- Up to 2 SPDT relays for alarm rated 3 A/220 Vac.
- Logic signal, open collector transistor, 24 Vdc, 40mA max. with isolation
- Solid-state relay, rated 2 A/250 Vac with isolation.

Serial Communication:

RS485, with communication protocol Profibus DP-V0

Configuration:

By front panel push-buttons.

Sampling rate:

480 ms sampling rate. The display is updated each second.

Accuracy:

± 0.1 % of full scale for RTD.

Linearization:

± 0.1 °C for RTD.

Thermal stability:

± 0.005 % / °C of span with reference to 25 °C ambient temperature.

Power supply:

75 to 264 Vac 50/60Hz or 100 to 360 Vdc (any polarity), 10 W nominal; 24 Vac/dc (± 10 %); 12 Vdc (± 10 %).

Operating ambient:

0 to 50 °C temperature and 90 % maximum relative humidity.

Dimensions:

¼ DIN (96 mm x 96 mm x 187 mm), HxWxD,
panel cut of 92 mm x 92 mm, HxW.

Weight:

0.7 kg nominal.

Warranty:

One-year

2.0 - Installation

2.1 - Mechanical Installation

DMY-2015-PB-Energy Indicator front panel has 1/4 DIN size (96 X 96 mm).
It is fixed by the rails which press it against the back side of the panel.

After preparing a 92 x 92 mm cut in the panel, remove the rails from the Indicator and slide its rear through the cut until its front reaches the panel. Place the rails again in the Indicator from the back of the panel and tighten the screws as shown in figure 2.

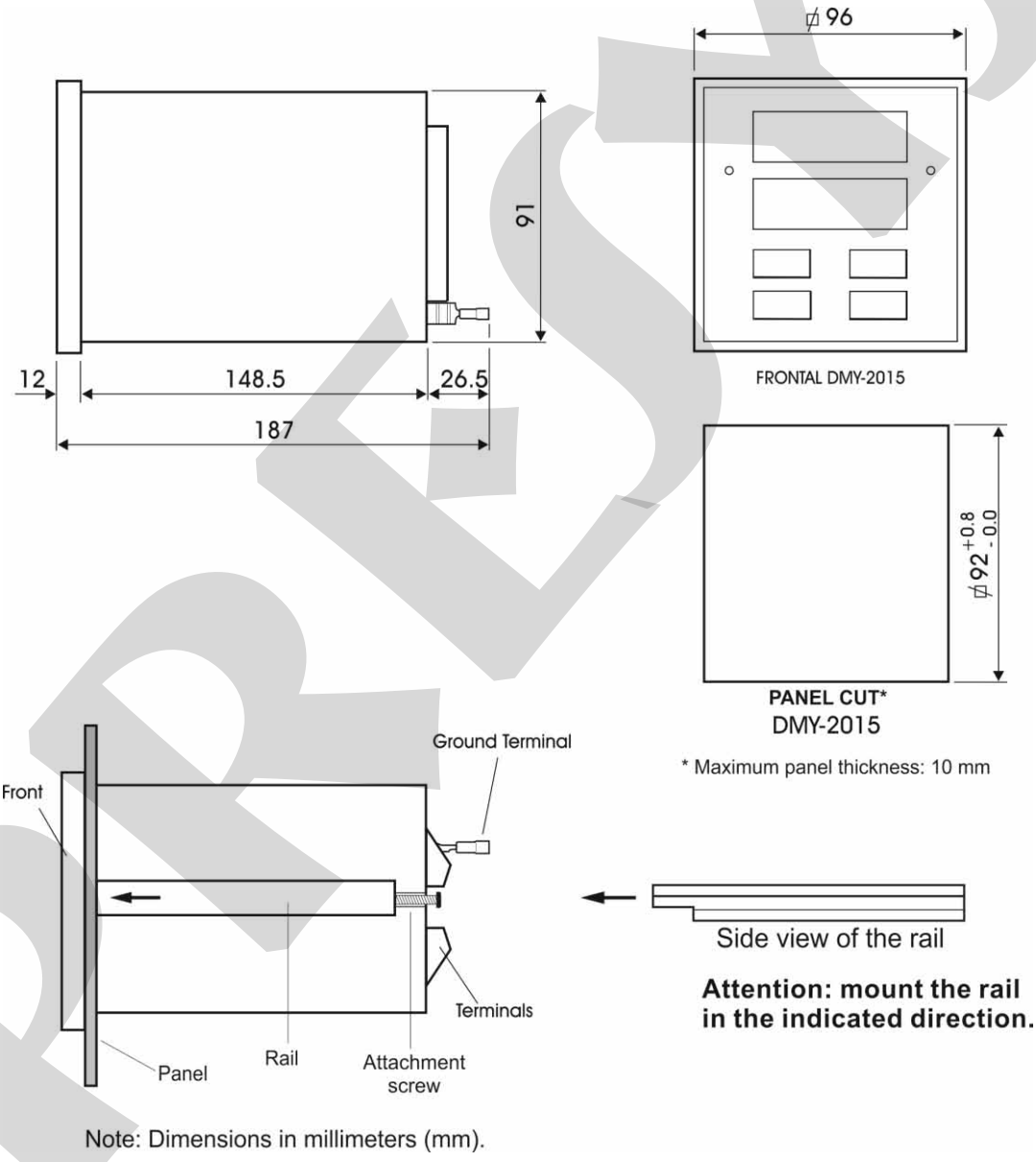


Fig. 2 - Dimensional drawing, panel cutout and side view

2.2 - Electrical Installation

The DMY-2015-PB-Energy indicator may be powered up by voltage between 75 and 264 Vac or 100 to 360 Vdc, any polarity. Remember that the internal circuit is powered whenever the instrument is connected to the external power supply.

Connections of process input and output signals should only be done with the instrument turned off.

Figure 3 shows the instrument I/O terminal scheme with all designations for power supply, grounding, communication and process input and output signals.

Signal wiring must be kept far away from power wires.

Due to its metal case the instrument ground should be connected to earth ground. Never connect the ground to neutral terminal.

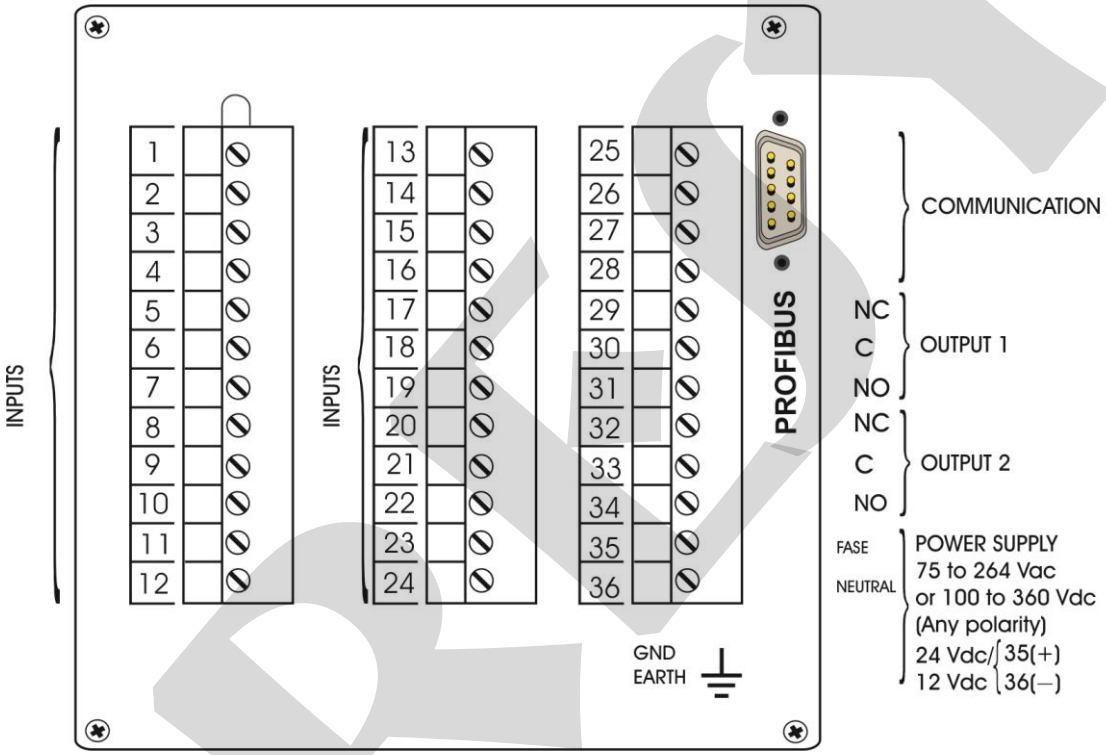


Fig.3 - Indicator terminals

2.3 - Process Input Signal Connections

The Indicator presents specific inputs for connection of RTD sensors. See the different types and ranges of input sensors in table 1, section 1.3 on Technical Specifications.

In order to avoid noise in the wiring, use twisted pair cable and cross sensor connection wire inside a metallic tube or use shielded cable. Make sure to connect only one shield wire end either to board terminal or to sensor ground, as shown in the next items.

WARNING: GROUNDING TWO SHIELD WIRE ENDS MAY CAUSE NOISE IN THE INDICATOR.

2.3.1 - RTD Connections

Connection is allowed for 2, 3 or 4 wires RTD. All types of connection are shown in figure 4, and the connection terminals for RTD are described in table 2 below for each channel.

Channel	Terminals	3rd wire Terminal
1	1 and 3	2
2	4 and 6	5
3	7 and 9	8
4	10 and 12	11
5	13 and 15	14
6	16 and 18	17
7	19 and 21	20
8	22 and 24	23

Table 2 - RTD input terminals

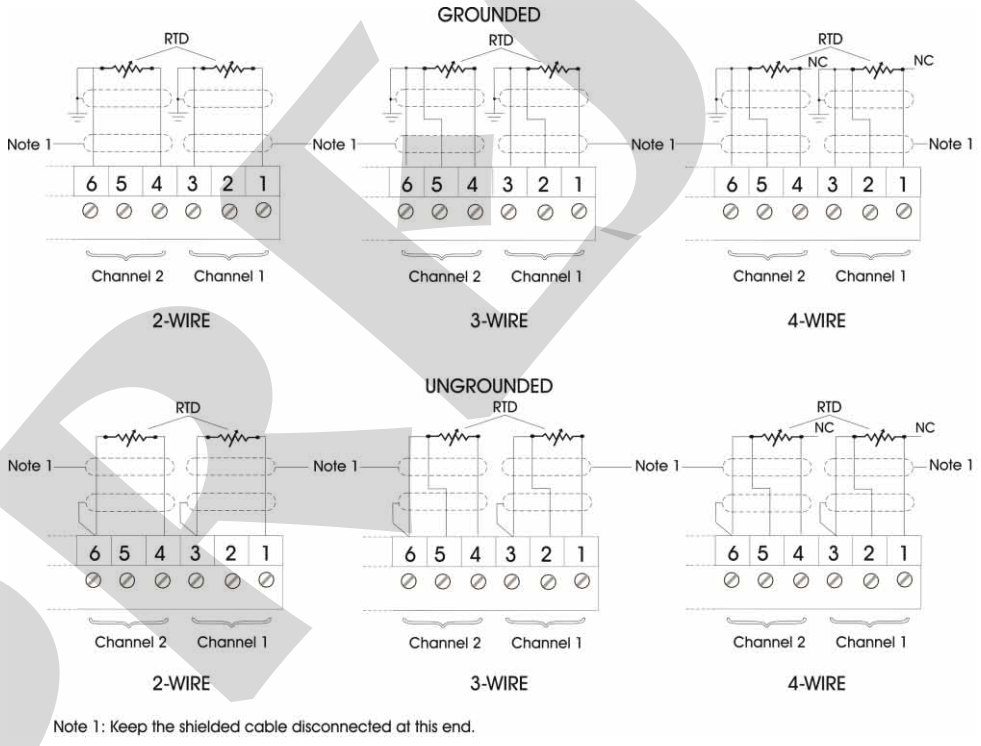


Fig.4 - RTD connection

A 2-wire RTD is connected, for example, to terminals 1 and 3 when using input 1 as shown in Figure 4.

A 3-wire RTD is connected in the same way as explained for a 2-wire RTD, adding the connection of the compensation wire to terminal 2 for input 1.

Connect a 4-wire RTD as indicated for a 3-wire RTD and keep its forth wire disconnected. See figure 4.

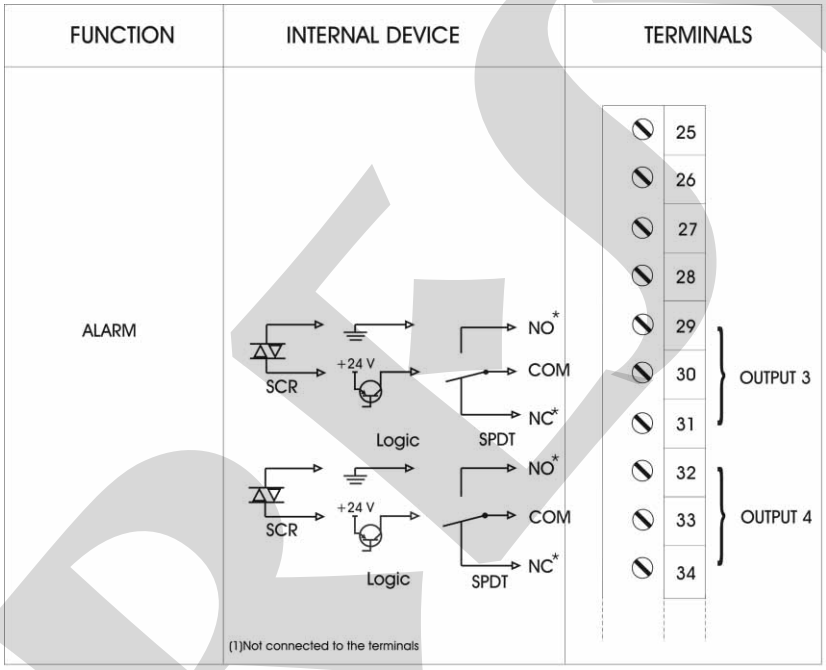
With a 3-wire RTD one gets a better accuracy than with a 2-wire RTD.

Use wires of same material, gauge and length on all 3 terminals of each channel for compensating resistance. The maximum resistance of each connection wire must be 10 Ω. Use 18 AWG wire (minimum) for distances up to 50 m and 16 AWG for distances greater than 50 m.

2.4 - Alarm Output Connection

The Indicator presents up to two alarm outputs obtained through the installation of modules with SPDT relay (up to 2), open collector voltage or solid state relays. Figure 5 illustrates the Indicator outputs.

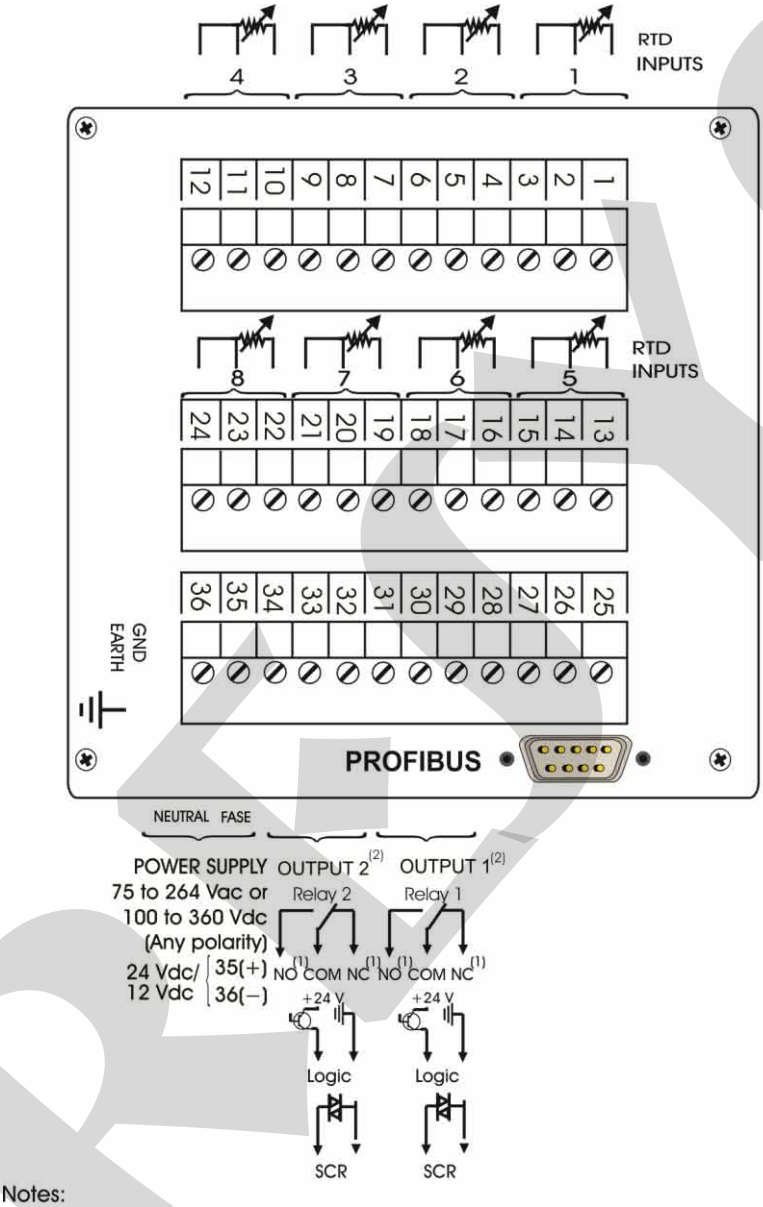
See sections 3.2 on Configuration and 4.3 on Optional module Connection for details on configuration and installation of optional modules.



(*)The relay contacts assume that the instrument is powered off.

Fig.5 - Output Connections

2.5 - Connections Diagram



Notes:

(1) Position of relay contacts (NC and NO) when the indicator is powered off When powered-on, the position of the contacts depend on the configuration of the SAFE option and the alarm condition of the instrument. The table below shows the states of the relays in all conditions:

POWER	SAFE	Alarm Condition	Relé 3 Terminals 29 and 30	Relé 4 Terminals 32 and 33
OFF	---	---	OPENED	OPENED
ON	YES	NO	CLOSED	CLOSED
ON	YES	YES	OPENED	OPENED
ON	NO	NO	OPENED	OPENED
ON	NO	YES	CLOSED	CLOSED

(2) Optional Modules

2.6 - Communication

The DMY-2015-PB-Energy Indicator has serial communication with Profibus DP-V0 protocol.

2.6.1 - Profibus DP-V0 Protocol

See Item 6.0 - PROFIBUS Communication.

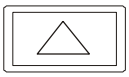
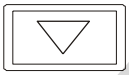
3.0 - Operation

3.1 - Normal Operation

DMY-2015-PB-Energy Indicator has two modes of operation: normal mode and configuration mode.

During normal operation, the Indicator monitors the inputs, verifies alarm conditions and activates the alarm outputs when necessary. Configuration mode is used to select and configure all the Indicator parameters.

The normal operation mode, in which the Indicator is to be found most of the time, is called level zero. In this level, the four front panel keys have the following functions:

Key		Function
UP		Switch the instantaneous value of the channels on display in ascending order. Lets continue with the automatic scanning of channels after your break.
DOWN		Switch the instantaneous value of the channels on display in descending order. Pauses automatically the scan of the channels and displays in descending order the channels with non-zero display time.
ACK		Features, if any, mnemonics corresponding to: - Disabled relays (trip alarms) due to the input sensor break (FLT.3 and FLT.4); - Alarms that require recognition or admit reset to return to normal state (AC.RL.3 and AC.RL.4); - Leds with retention (AC.L.1 to A.L.11) (*).
ENTER		Changes from zero to level 1 or asks for a password depending on configuration. When they have the mnemonics accessed via the ACK button: - Reactivates the relay with trip alarm that has been disabled due to input sensor break (FLT.3 and FLT.4); - Effectives relay recognition (AC.R.3 and AC.R.4) or led (AC.L.1 to AC.L.11) with retention after the alarm condition; and - Effectives relay reset (AC.R.3 and AC.R.4) (*).

(*)To show again the value of the monitored variable, still pressing the ACK key. If no relay or LED with activated retention, or relay that admits reset, the display No.Rt.

On the front panel of the instrument, the LEDs 1 to 8 are associated with alarms for channels 1 to 8, while the leds 10 and 11 depend on the states of the relays 3 and 4, respectively. When you activate a relay, the corresponding LED is on, and its deactivation causes the LED is switched off. The LED 12 indicates that the instrument is connected to the Profibus network.

In the operation mode it is possible to re-enable the trip alarms configured with failure manual reset (see section 3.2 - Configuration: Level 3 - Alarms) by following the procedure below:

(i) The message "B.OUT" flashes when viewing a channel, indicating that the sensor is broken and the relays with trip alarm were disabled;

(ii) Reconnect the sensor to the instrument terminals;

(iii) The display shows alternatively the value of the process variable and the mnemonic "FALT" (relays 3 and/or 4 disabled);

(iv) Enable the relays with TRIP alarms according to the steps below:

1. press ACK to show the mnemonic of the disabled relay (“FLT.3” or “FLT.4”);
2. press ENTER;
3. “FLT.3” or “FLT.4” disappears.
4. the display starts to show the next trip alarm mnemonic, if any, or relay mnemonic (AC.R.3 to AC.R.4) or led (AC.L.1 to A.L.11) latching requiring acknowledgment.

In order to pass to the next mnemonic without re-enabling the trip relay or acknowledging an alarm relay or led under latch condition, one must press the ACK key once again. After all available mnemonics are shown, the display returns to the channel process variable indication.

Note: If more than one relay is off, you must turn them in sequence, relay 3 to relay 4, pressing ENTER for the mnemonics “FLT.3” and/or “FLT.4”.

3.2 - Configuration

In order to access configuration mode the operator is required to provide a password which avoids a non-authorized person to change any critical parameters of the process.

So, when ENTER is pressed within the normal operation mode, one of the following events can happen, depending on the current configuration:

i) To access directly level 1 (GENERAL) of configuration mode, which indicates the instrument was not configured with a password system.

ii) To display the PASS warning, indicating that the instrument is provided with a password system (a key sequence or a value), according to figure 6.

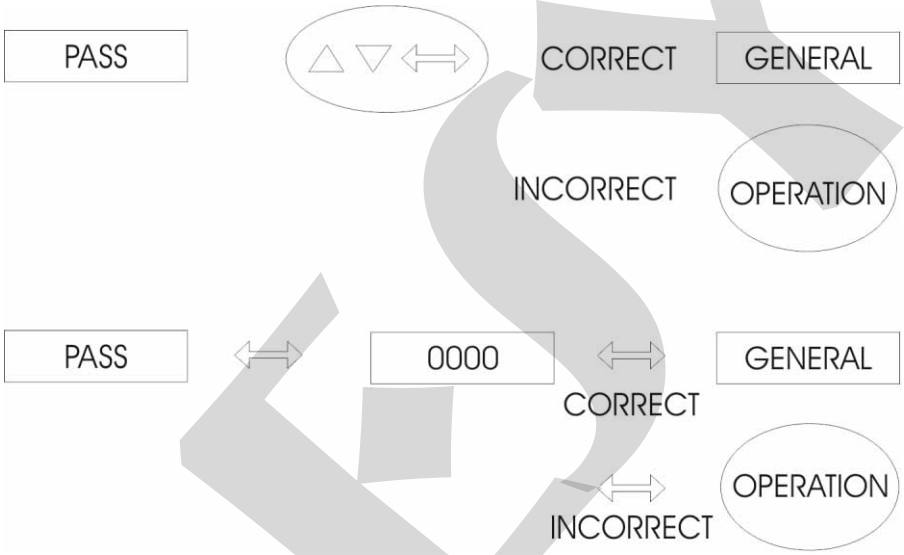


Fig.6 - Password through key sequence or value

In case of a key sequence password, the user should press the UP, DOWN and ENTER keys (exactly in this order) to access the configuration levels.

For a value password, the user must press the ENTER key for a second time in order to view the number 0000 with the right end digit blinking. The position which is blinking indicates the digit in the number to be changed by the user with the UP and DOWN keys. Move to the digits on the left by pressing ENTER. After entering all digits, press ENTER again. If the password is correct level 1 is accessed; otherwise, it returns to normal operation (see figure 6).

The user can choose also both password systems, key and value. In this case, if the user provides an incorrect sequence of keys, the display goes immediately to the value password system.

The password number may be chosen by the user (personal) or it could be used the number 2015. Note that the number 2015 is always accepted by the value password system, which helps the user in case he forgets his password. In order to enter a number for password or for any other parameter use the Indicator front panel keys with the following functions:

Key	Function
SOBE	Increases the digit
DESCE	Decreases the digit
ENTER	Moves to digit on the left

All configuration parameters are stored in the non-volatile memory and determine the instrument normal operation. Through such parameters the user can adapt the instrument according to his requirements, if he desires to change the factory configuration.

The configuration parameters are distributed over five increasing hierarchical levels, as shown in figure 7. In order to go through those levels and access the corresponding parameters the user may use the Module front keys with the following functions:

Key	Function
ENTER	Choose the level
UP	Switches to a higher level
DOWN	Switches to a lower level

Note: in the following diagrams, the Module display is represented by rectangles in response to the selection of ENTER, UP and DOWN keys.

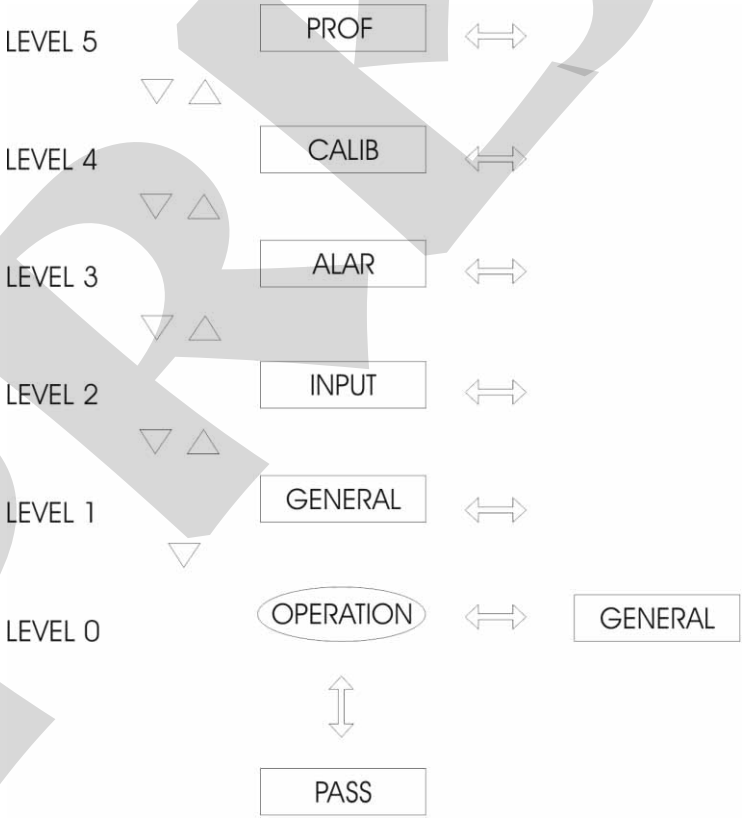


Fig.7 - Parameter levels diagram

The hierarchical levels are presented in sequence. The options of each level with all corresponding parameters are explained step by step.

Within each level, the front panel keys of the instrument have the following functions:

Key	Function
UP	Scrolls the options in ascending order
DOWN	Scrolls the options in descending order
ENTER	Confirms or advances the options within the level whenever the display does not show ESC. When the display shows ESC, one goes back one or more positions.

Level 1 - General

In level 1 we have the options: TAG, V.SFT, PASS e INDC (see figure 11).

TAG - consists in an alphanumeric identification for the instrument. The procedure to enter the tag or any other parameter is the same as described previously for the password (refer to value password for the functions of the ENTER, UP and DOWN keys).

SOFT - shows software version.

PASS - allows the user to enable or disable the password system for accessing the configuration mode. The password system may be chosen as a key sequence, a value (number chosen by the user and number 2015) or both. The correct key sequence is obtained by pressing the UP, DOWN and ENTER keys in this order.

INDC - is an option for the visualization of the measured variables on the display. It allows the user to view the values of different channels only by pressing the UP and DOWN keys, or it sets the instrument to change automatically the indication of different measured variables among some selected channels. In order to enable the automatic scan mode, choose the YES option for INDC and provide the exhibition times (given in seconds) for viewing each channel (channel 1 is the only one whose time cannot be zero). The exhibition time configured for a channel refers to the indication of the measured variable.

In operating level, you can make a pause in auto scan the channels via the front panel keys. Use the DOWN button to make a pause in the scanning and display each channel with nonzero display time. To continue automatic scanning, press UP.

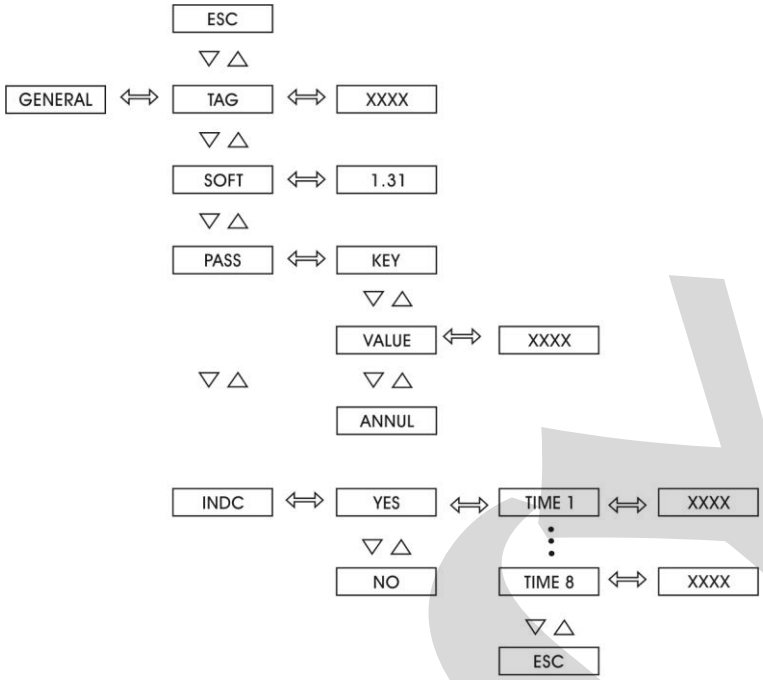


Fig.8 - General Level Options

Below is the adjustable range of the parameters shown in Figure 8.

Mnemonic	Parameter	Range	Factory Value	Units
TAG	instrument identification	————	2015	————
SOFT	software version	————	1.31	————
VALUE	user password	-999 to 9999	0	————
TIME1	channel 1 exhibition time	1 to 3000	5	seconds
TIME2 to TIME8	channels 2 to 8 exhibition time	0 to 3000	1	seconds

Level 2 - Inputs

The Input Level allows to enable or disable (by means of the ANNUL option), the sensor type of each channel. The sensor type options are 2 and 3-wire for RTD inputs as shown in figure 9.

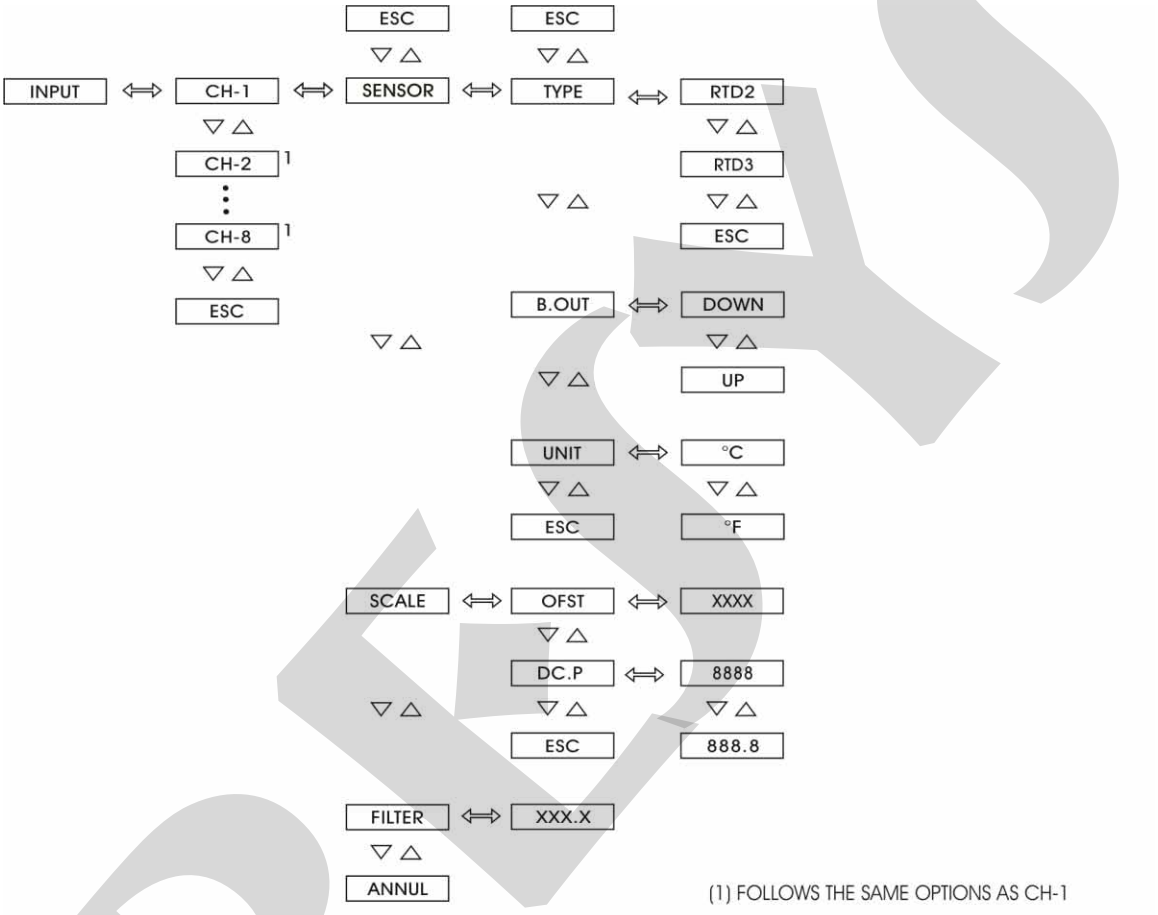


Fig.9 - INPUT Level options

Below is the adjustable range of the parameters shown in Figure 9.

Mnemonic	Parameter	Range	Factory Value	Units
OFFSET	constant added to display indication	-999 to 9999	0	EU
FILTER	time constant of 1st order digital filter	0.0 to 25.0	0.0	seconds

(**) EU - Engineering Unit

DC.PT - sets the decimal point position for visualization of Engineering units in display. There are up to one decimal place or none.

OFST - allows the user to enter an off-set value in Engineering Units to be added to the measured variable. This is useful in case of monitoring instruments that have the

same process variable, but with slight differences in reading. This parameter can be used to equalize measurements in different instruments.

FILTER - this parameter provides the time constant of a first order digital filter associated to the selected input. In order to leave the signal without filter set this parameter to zero.

B.OUT - When temperature sensors break (RTD) or the wires are disconnected, the display indicates burn-out to the corresponding channel. In this case, choosing the UP option for this parameter activates the high-alarms and the DOWN option activates the low-alarms.

UNITS - selects °C or °F for temperature indication.

Level 3 - Alarms

The Indicator has up to two alarm devices (see figure 10) followed by the leds associated to each channel.

Each alarm device can support any combination of high (HI), low (LO) and fail (FAIL) alarms of the channels. The fault alarm is activated when detecting the breakdown of input sensor.

In order to do not activate a relay with high and low alarms, but without trip function, upon the occurrence of sensor break, one can make use of B.OUT of INPUT option level.

The relays 3 and 4 may be configured as trip relay for temperature inputs (RTD), preventing the alarm being triggered in case of sensor break or in the moment when the sensor connections are redone. It is allowed to configure the relay with high trip (HI) after selecting YES to TRIP option. To disable the trip function, you must configure TRIP to NO.

Once selected the type of trip, one should proceed to the high alarm setting (HI) of at least one of the channels. In this case, it will not show the low alarm options (LO) or fault (FAIL).

Note: Configure SAFE as NO for relays with trip alarms.

When there is a sensor break in a channel associated with a relay with trip, the alarm has temporarily disabled its verification (*relay fault*), although it remains configured in the ALARM level. Right after the relay is disabled, the state of the alarm is determined by the RL.F option (shown together with the CH-1 to CH-8 options after selecting the alarm relay). When configuring RL.F as RLS (release), the relay is released from the alarm state of the input with the broken sensor (maintaining the contact in the non-alarm position) so that the relay state is determined by the remaining channel, if enabled. When LAST is selected for RL.F, the relay maintains the last alarm state presented by the input with the broken sensor. In this way, for relay 3 with a high trip alarm for both channels and in alarm condition due to channel 1, for instance, the sensor break would change the relay contact to the non-alarm position for RLS, while its position would be maintained for LAST.

After the proper re-connection of the sensor to the input, one must apply a reset to the disabled relay so that the instrument continues to check the alarm which was disabled. The reset mode is defined by the RST.F option as automatic (AUTO) or manual (MANU). RST.F is shown together with the CH-1 to CH-8, and RL.F mnemonics after the selection of the relay. For the automatic reset mode, the alarm relay is re-enabled as soon as the instrument detects the sensor connection, while the manual reset mode requires the operator to apply the reset in the operation level of the instrument. For the latter case, the end of the break condition makes the display to alternate between the process variable indication and the FAIL mnemonic. One must then press the ACK key in order to show the mnemonic for the first disabled relay (FLT.3 or FLT.4) and apply the reset by pressing ENTER. Press again the ACK key to pass to the next mnemonic, be it the second disabled relay (FLT.3 or FLT.4) or those for alarm or led acknowledgement. After presenting all available mnemonics, the display returns to the process variable exhibition.

It is only possible to configure the failure alarm for relays 3 and 4 with the trip function disabled.

After configuring the alarms (CONF option) the operator can have direct access to the setpoint values of the high and low alarms to check or even change them. For this, one must go to the CONF mnemonic and then press the UP key, so that the setpoints of all configured alarms are accessed. The alarm setpoint mnemonics and the failure alarm mnemonics (the latter are shown only to indicate that the alarms are enabled) are explained according to the examples below:

1H.r3	Set point of the channel 1 high alarm associated with relay 3
2L.r4	Set point of the channel 2 low alarm associated with relay 4

The adjustable parameter range shown in figure 10 is given below.

Mnemonic	Parameter	Adjustable Range	Factory Value	Unit
SP	alarm set point	-999 to 9999	25.0 - Low alarm 75.0 - High alarm	EU
HYST	alarm hysteresis	0 to 250	1.0	EU
DELAY	delay for activating the relay	0.0 to 999.9	0.0	seconds

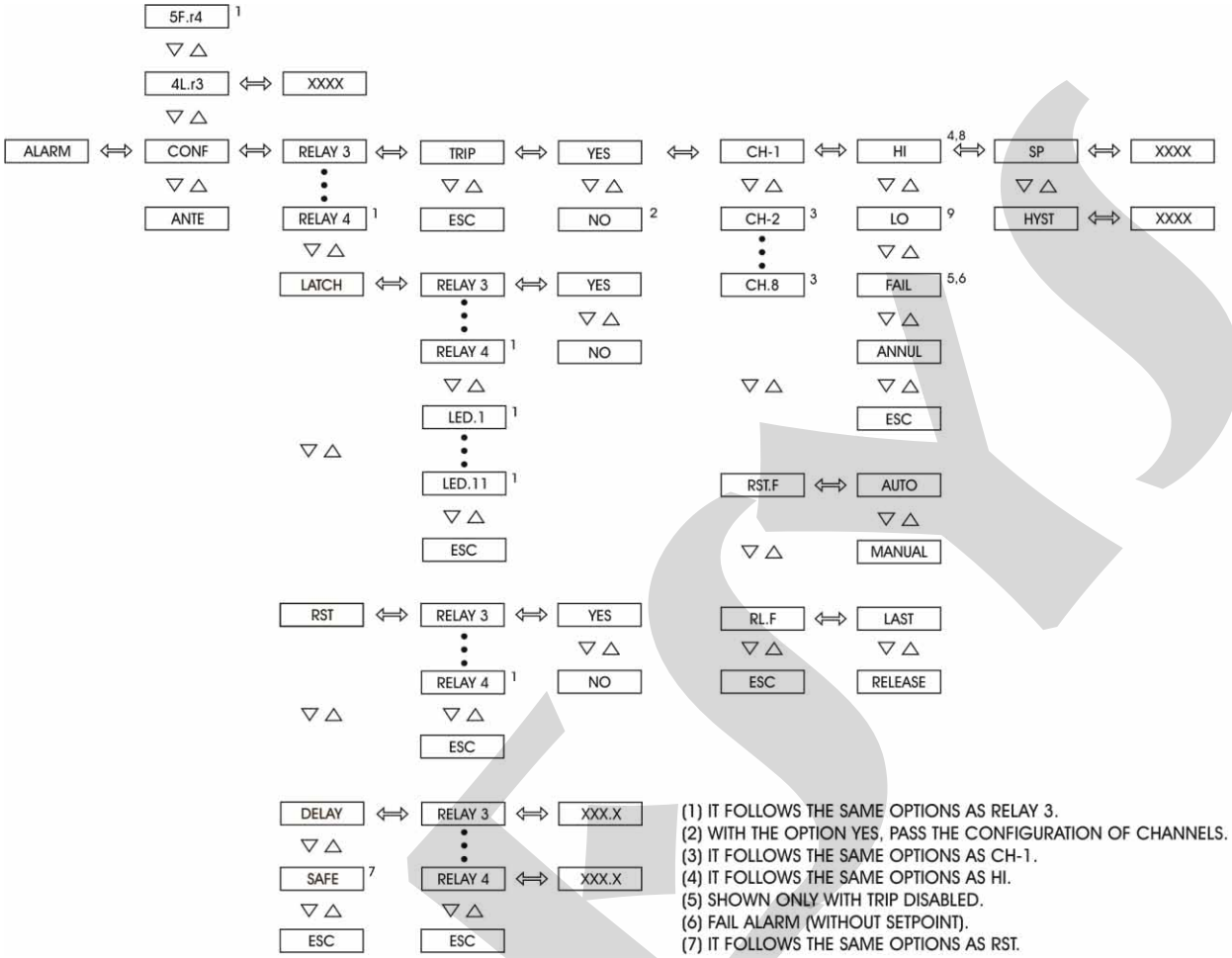


Fig.10 - ALARM Level Options

On the front panel of the instrument, the LEDs 1 to 8 are associated with alarms for channels 1 to 8, while the LEDs 10 and 11 depend on the states of the relays 3 and 4, respectively. In this case, when activating a relay, the corresponding LED is on, and its deactivation causes it to turn off.

LATCH - configures the relay to be deactivated only after the end of the alarm condition and the operator has performed the acknowledge of this alarm. It can be also set latch to the LEDs 1 to 11. A certain LED remains on during the trigger condition (activated alarm or relay) and, at its end, the LED will flash, indicating the need for recognition by the operator.

The acknowledgment of an alarm condition or state of the LED is done in normal operation. Must be pressed the ACK button, passing through the mnemonic of fault relays, if any. In sequence, are shown mnemonics of the relays that require acknowledgment (AC.R.3 and AC.R.4) and then the LEDs (AC.L.1 to A.L.11). Note that only appear relays and LEDs configured to latch and only if they need acknowledgment to return to normal state. Press ENTER to acknowledge the state of the relay or LED, or press ACK, to not make their recognition and move to the next mnemonic. If the alarm or relay status condition still persists, when you press the ENTER key to the corresponding mnemonic, the display will continue to show it and the relay or LED status will be maintained. Otherwise, the relay is turned off or the LED turns off and the display goes to

the next mnemonic list, indicating that the acknowledgment was performed. To return to operating mode should continue pressing the ACK key.

RST - it allows the relays to be deactivated even when the alarm condition which activated these relays is still present (relay reset).

In order to deactivate a certain relay with RST function enabled, one must press ACK when in operation level, and choose the mnemonic corresponding to the activated relay by pressing ENTER. Continue pressing the ACK key to return to operation mode.

The relay will be activated again if the current alarm condition finishes and then returns, or in case of occurrence of other alarm conditions which were not presented before.

DELAY - causes the relay to be activated only after a certain time interval defined by the user. Figure 11 below illustrates the delay operation for a high-alarm. If the trip function is enabled, you must set this value to 5.0 seconds.

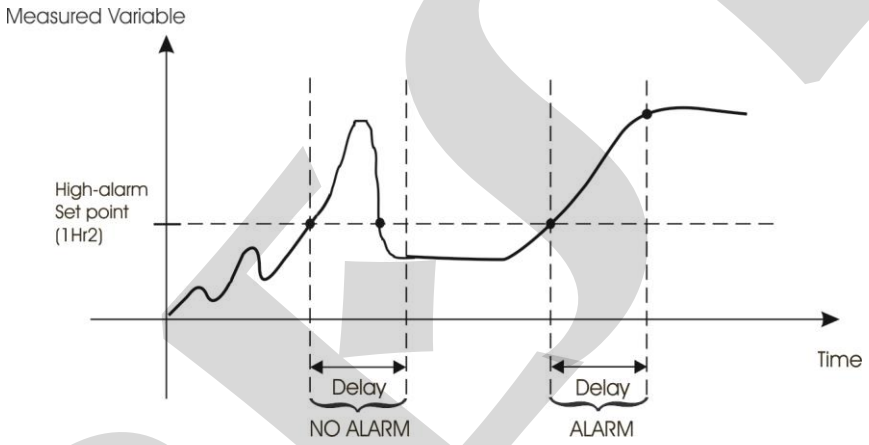


Fig.11 - Relay with Delay

The security condition to relays means that the relay coils are energized when the instrument is turned on, and are de-energized in alarm condition or in case of power failure. Configure SAFE as NO if the corresponding relay is set as trip alarm.

Level 4 - Calibration

Level 4 is described on section 4.4 on Calibration

4.0 - Maintenance

4.1 - Indicator Hardware

The Indicator maintenance requires the user to have access to the hardware of the instrument. The Indicator hardware consists of four main boards: Display Board, CPU Board, Power Supply Board and Input Board. The four-board system is fixed to the aluminum case by a screw on the lower part of the front-panel. Loosen this screw and pull the Indicator front-panel in order to remove the instrument from the case.

The Display board is located in the Indicator front-panel. The front-panel has four internal holders near its four corners which keep together the CPU and Power Supply Boards. The Input Board is connected to the CPU Board by means of two flat cables, and the boards are fixed by 3 spacers. There is another spacer between the CPU and Power Supply Boards. Follow the instructions below to open the set:

i) Remove the screw which fixes the spacer placed near the edge of the CPU and Power Supply Boards.

ii) Turn the Indicator so that the display is on the opposite side for reading.

iii) Displace carefully the holder at the right top corner of the front-panel.

iv) Move the Power Supply Board to the right and open the boards according to Figure 12.

v) Remove the screws which fix the spacers between the CPU and Input Boards.

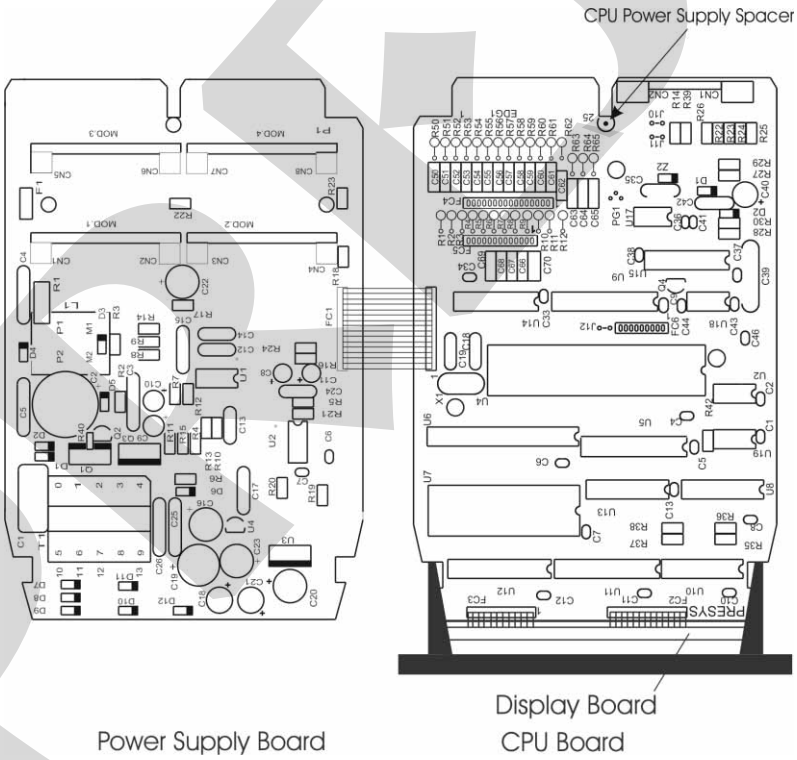


Fig.12 - Indicator Hardware

4.2 - Using Snubber with relays

Relay modules are provided with circuits for eliminating electrical arch (RC snubber). The snubbers can be put in parallel with the relay contacts, by placing the jumpers J1 and J2 localized on the back of the relay board. When the jumpers are not placed, the relay contacts are kept without snubbers. The relay module is sent from factory with the jumpers placed.

Note the position of the jumpers in the following figure. Depending on the board version, the jumpers may be either the front side or back side.

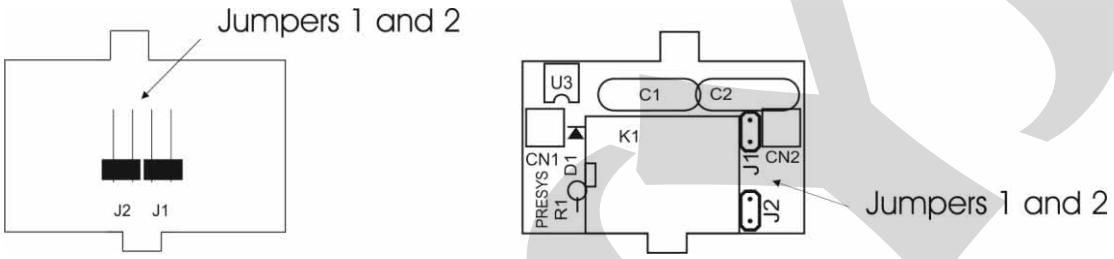


Fig.13 - Jumpers for the selection of snubbers on the relay board

Alarm and control relays are extremely critical in control and safety of industrial processes. In order to ensure the expected relay behavior, consider the following two loading conditions.

- High currents circulating through the relay contacts (from 20 mA to 3 A). When the relay switches high currents there is the occurrence of electrical arch which damage quickly the relay contacts. Besides, electrical noise is generated. In these conditions, it is recommended to use the RC snubbers which come with the relay module (placed jumpers).

- Low currents circulating through the relay contacts (less than 20 mA). The relays could not function properly when the jumpers are placed. In this case, the snubbers maintain a 4.5 mAac/9.0 mAac current when connected to a 120 Vac/220 Vac circuit. This current is enough, in certain cases, to power a horn or alarm lamps, preventing their deactivation. In this situation, there is no need to use the snubbers and the jumpers must be removed.

Note: If your module board relay does not have the mentioned jumpers, it is because it belongs to an earlier version. Worth it for the same reasons explained above regarding the use of RC snubber. However, in this case, to remove the snubber, you should remove the two capacitors 0,1 μF x 250 V located above the relay.

4.3 - Installation of optional modules

The DMY-2015-PB-Energy Indicator accepts up to two alarm devices and the PB communication, which must have the corresponding optional modules installed in the instrument. Open the Indicator as shown in section 4.1 in order to access the connectors in the Power Supply Board, and one connector in the CPU Board (see figure 14).

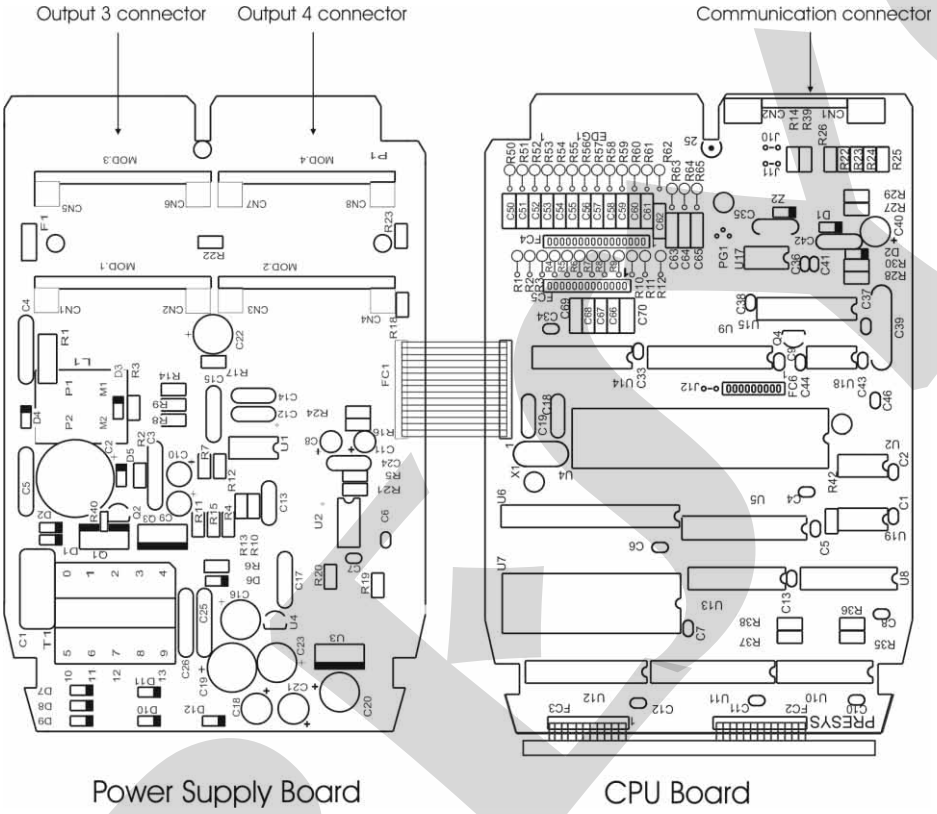


Fig.14 - Optional module connectors

The connectors in the Power Supply Board corresponding to outputs 3 and 4 (figure 3) are called MOD 3 and MOD 4. The connector for the communication module is placed in the CPU Board and has no label. Any optional module must be always installed with the component side in the direction of the Display Board, as shown in figure 15.

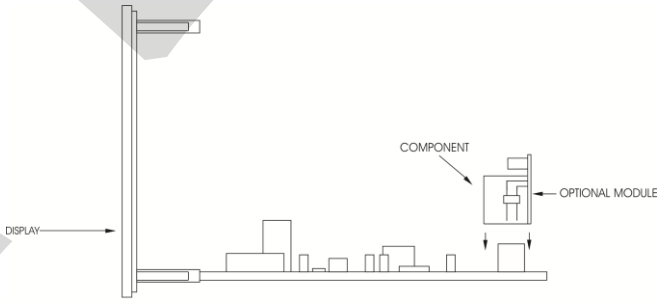


Fig.15 - Installation of optional modules

Alarm outputs 3 and 4

Outputs 3 and 4 are used as alarms when the optional modules corresponding to connectors MOD 3 and MOD 4 are installed. There are three types of alarm output available: SPDT relay, solid state relay and open collector voltage. The Alarm output type and the optional module correspondence are shown in table 3.

Alarm output type	Optional module code
SPDT Relay	MALRE - 20
Solid State Relay	MALRS - 20
Open collector voltage	MSD - 20

Table 3 - Alarm output types

4.4 - Calibration

Warning: Only enter the following options after understanding them perfectly. Otherwise, it may be necessary to return the instrument to the factory for recalibration. Calibration in this manual means adjustment.

DMY-2015-PB-Energy Indicator is accurately calibrated in factory and doesn't need periodic calibration in normal conditions. When calibration is required, follow this procedure below.

- Disconnect the process signals of I/O terminals.
- Before calibrating the instrument, keep it turned on for at least 30 minutes for warm up.

The accuracy and precision of the calibrator used for generating references must be at least twice as good as the specifications of the Indicator.

The following tables list the references related to the type of input to be calibrated. The left column shows the mnemonics presented on the display during the calibration process.

Before performing the calibration, enter level 4 of Calibration. The calibration level has a password system which avoids someone to enter this level accidentally and damage any calibration parameter. **The password for entering this level is number 5.**

Once the correct password is provided, select the input type to be calibrated. Choose the channel to be calibrated by pressing ENTER. The display shows the mnemonics related to the references required for the calibration process. The references must be applied before the corresponding mnemonic is shown on display. When the reference is stable, start the calibration by pressing ENTER. At this moment the Indicator begins the calibration process while the mnemonic CAL blinks on the display.

While the display is blinking the reference must be connect to the input channel you want to calibrate.

When the display stops blinking and presents the mnemonic corresponding to the reference, the calibration process of the first calibration point will be finished.

Change to the next reference and press DOWN to select another point. Between any two calibration points wait 1 minute at least. After this time is elapsed, press ENTER to start calibrating this point.

After performing all references on the table related to the input type to be calibrated, the calibration process will be finished.

It is possible to calibrate only one point without rendering invalid the other points already calibrated, in case the calibration of this point was not carried out properly.

In order to return to normal operation move back through the hierarchical levels until reaching level zero.

Figure 16 shows the calibration options for the instrument:

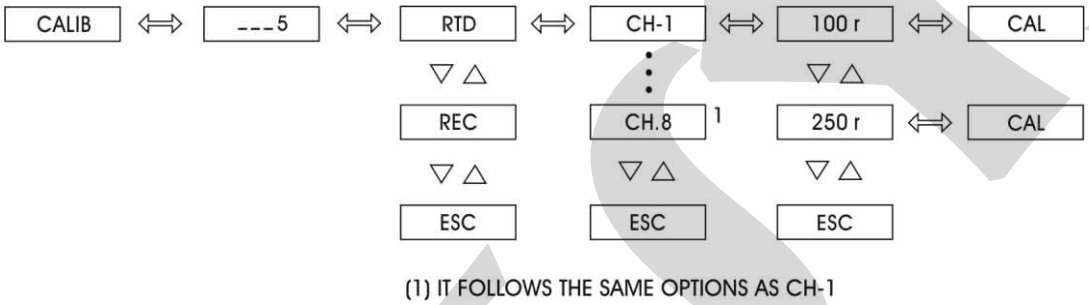


Fig.16 - CALIBRATION level options

Calibration of 2 and 3-wire RTD input

In a 3-wire RTD input calibration connect precision resistances with the values listed in table 4 to the channel to be calibrated. For channel 1, for instance, the resistance must be connected to terminals 1 and 2, with terminals 2 and 3 short-circuited. See the terminals for RTD connection on table 3, section 2.3.1 on RTD Input.

When using a resistance decade, make sure the three connection wires must have the same gauge, material and length.

There is no procedure for a 2-wire RTD calibration. It is accomplished together with the 3-wire RTD calibration.

Reference	Mnemonic
100.000 Ω	100r
250.000 Ω	250r

Table 4 - Resistance references for 3-wire RTD input calibration

Return to factory calibration

The Indicator stores the factory calibration parameter values on the non-volatile memory, which may be always recovered by Indicators with RTD input.

In case of a bad performance of the instrument due to an incorrect calibration, use the REC option.

REC - is the option that allows to recover the factory calibration.

Enter level 4 of Calibration, select the REC option and press ENTER in order to recover the values from factory.

4.5 - Hardware maintenance instructions

Before sending the instrument back to factory check the following probable causes of a malfunctioning Indicator.

Instrument with error indication on display

After turning the instrument on, it tests RAM and E2PROM integrity.

When at least one of these components presents some problem the display shows the following error codes:

Er. 01 - RAM error
Er. 02 - E2PROM error

In case of RAM error, turn the instrument off and on to check if the error message is displayed again. If the error remains, return the instrument to factory.

When there is E2PROM error, press the ENTER key and configure the instrument again. Turn the instrument off and on to check if the error message is displayed repeatedly. If the error remains, return the instrument to factory.

Instrument with the display out

Check if power supply voltage is provided to terminals 35 and 36 of the Indicator.

Verify the integrity of fuse F1 of 2.0 A placed in the Power Supply Board as shown in figure 14. Due to its package it is necessary to check the fuse continuity in order to detect if it is broken.

Instrument malfunction

Check if the Indicator is configured correctly.

Examine if the optional modules are connected in the right spots.

Check if the voltages on flat cable 1 as shown in figure 17 are close to the values in table 5 and if they reach the CPU Board.

Test points on flat cable 1	Voltage
Between point 1(-) and point 2(+)	5 V
Between point 9(-) and point 8(+)	8 V
Between point 9(-) and point 1(+)	0 V
Between point 9(-) and point 10(+)	- 8 V
Between point 9(-) and point 13(+)	24 V
Between point 12(-) and point 11(+)	5 V

Table 5 - Inspection points of voltage on flat cable 1

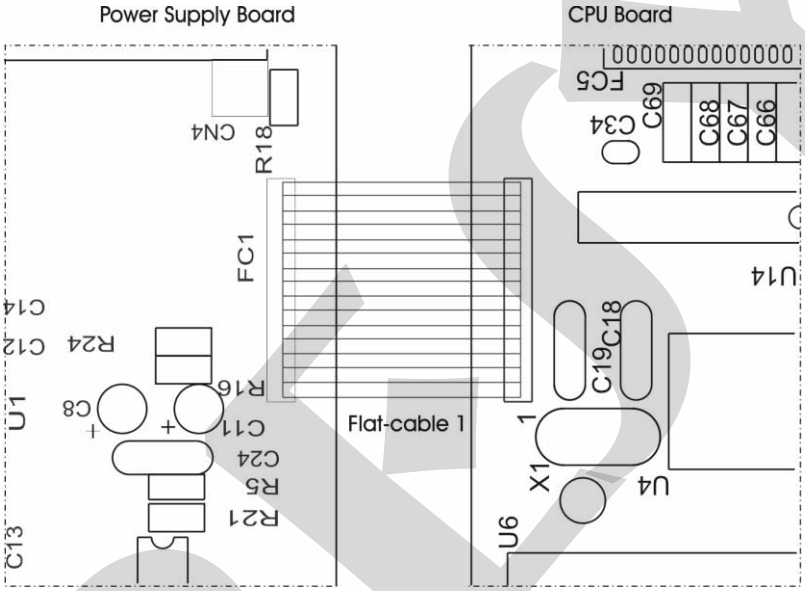


Fig.17 - Voltage test points of the Indicator

Measure voltages on flat cable 5, which connects the CPU and Input Boards, check if they are close to the values in table 6.

Test points on flat cable 5	Voltage
Between point 12(-) and point 13(+)	8V
Between point 12(-) and point 11(+)	-8V
Between point 12(-) and point 3(+)	0V

Table 15 - Inspection points of voltage on flat cable 5

If the cause of the problem was not discovered, the Indicator must be sent to factory.

4.6 - List of components

Display Board

Code	Components	Reference
01.05.0079-20	Display Board - DMY2015	----------
01.07.0002-21	Display 14mm	DP1,2,3,4,5,6
01.04.0001-21	Diode 1N4002	D13,14
01.07.0005-21	Led 3mm (red)	D1,2,3,4,5,6,7,8,9,10, 11,12
01.09.0013-21	Transistor BC 327	Q1,2,3,4,5,6,7,8
01.15.0003-21	Push-button	CH1,2,3,4

Power Supply Board

Code	Components	Reference
01.05.0046-20	Power Supply Board	----------
01.01.0029-21	LM 2940CT - 5.0 V	U3
01.01.0051-21	LM358N	U2
01.01.0030-21	UC 3842	U1
01.09.0015-21	Transistor BC 337	Q2
01.09.0019-21	Transistor TIP 50	Q1
01.09.0020-21	IRF 822	Q3
01.02.0122-21	Fuse 2A	F1
01.01.0028-21	78L24	U4
01.04.0007-21	Diode 1N4007	D1,2,3,4
01.04.0008-21	Diode 1N4936	D5,6,7,8,9,10,11,12
01.03.0009-21	Ceramic Disc Capacitor 100 pF x 100V	C12,13,14
01.03.0035-21	Ceramic Multilayer Capacitor 0.1µF x 63V	C6,7
01.03.0036-21	Ceramic Multilayer Capacitor 0.01µF x 63V	C24
01.03.0039-21	Polyester Capacitor 0.1 µF x 250 V	C1,3
01.03.0022-21	Polyester Capacitor 0.01 µF x 100 V	C15,17
01.03.0041-21	Polyester Capacitor 0.01 µF x 250 V	C4,5
01.03.0042-21	Radial Electrolytic Capacitor 22 µF x 25 V	C9,C10
01.03.0027-21	Radial Electrolytic Capacitor 100 µF x 25 V	C18,21
01.03.0043-21	Radial Electrolytic Capacitor 100 µF x 35 V	C16,22
01.03.0044-21	Radial Electrolytic Capacitor 220 µF x 10 V	C8,11,20,23
01.03.0045-21	Radial Electrolytic Capacitor 22 µF x 350 V	C2
01.03.0002-21	Radial Electrolytic Capacitor 1000µF x 16V	C19
01.03.0068-21	Polyester Capacitor 4n7 x 400V	C25, 26
01.02.0105-21	Resistor 18R x 2W	R1
01.02.0111-21	Resistor 1R 5%	R15
01.02.0126-21	Resistor 220R 5%	R10
01.02.0114-21	Resistor 270R 5%	R4
01.02.0074-21	Resistor 470R 5%	R17, 18, 22, 23
01.02.0075-21	Resistor 1K 5%	R16, 24
01.02.0080-21	Resistor 4K7 5%	R8, 12
01.02.0082-21	Resistor 10K 5%	R5, 20, 21
01.02.0116-21	Resistor 18K 5%	R7
01.02.0083-21	Resistor 20K 5%	R11
01.02.0110-21	Resistor 27K 5%	R14
01.02.0085-21	Resistor 47K 5%	R3
01.02.0106-21	Resistor 150K 5%	R9
01.02.0088-21	Resistor 470K 5%	R2
01.02.0006-21	Resistor 20R 1%	R6
01.02.0183-21	Resistor 2K32 1%	R13
01.02.0108-21	Resistor 15K4 1%	R19

Code	Components	Reference
01.02.0131-21	Resistor 4K99 5%	----------
01.04.0005-21	Reference Diode LM336/5V	----------
01.06.0003-21	Transformer 110/220Vac	T1
01.06.0004-21	Coil	L1
01.13.0004-21	Connector	CN1,2,3,4,5,6,7,8

CPU Board

Code	Components	Reference
01.05.0080-20	CPU Board	----------
01.01.0007-21	LM 311	U18
01.01.0016-21	EPROM 27C512	U7
01.01.0050-21	MB84256-10L-SK	U6
01.01.0044-21	E2PROM X25C43P	U19
01.01.0019-21	4051	U14
01.01.0020-21	TC-4053	U15
01.01.0021-21	74HC02	U13
01.01.0022-21	74HC138	U8
01.01.0023-21	74HC365	U10
01.01.0024-21	74HC373	U5,9,11,12
01.01.0045-21	80C32	U4
01.01.0027-21	AD 712 JN	U17
01.16.0001-11	Crystal 11.0592 MHz	X1
01.09.0013-21	Transistor BC 327	Q4
01.04.0003-21	Diode 1N4148	D1,2
01.04.0006-21	Zener BZX 79/C6V2	Z2
01.03.0067-21	Ceramic Disc Capacitor 56pF x 50 V (4 mm)	C18,19
01.03.0035-21	Ceramic Multilayer Capacitor 0.1µF x 63V	C1,4,5,6,7,8,9,10,11,12, 13,33,34,35,36,37,38,41, 42,43,44
01.03.0039-21	Polyester Capacitor J(5%) 0.1 µF x 250 V	C39
01.03.0027-21	Radial Electrolytic Capacitor 100µF x 25 V	C40
01.02.0103-21	Resistor 68R1 1%	R24
01.02.0010-21	Resistor 100R 1%	R29
01.02.0102-21	Resistor 442R 1%	R23
01.02.0019-21	Resistor 1K 1%	R22,30
01.02.0024-21	Resistor 2K 1%	R27
01.02.0104-21	Resistor 3K32 1%	R25
01.02.0036-21	Resistor 8K66 1%	R28
01.02.0046-21	Resistor 40K2 1%	R26
01.02.0038-21	Resistor 10K 1%	R35,36,37,38,39
01.02.0040-21	Resistor 15K 1%	R42
01.02.0098-21	Resistor 10M 5%	R1,2,3,4,5,6,7,8,9,10, 11,12
01.13.0043-21	DIP socket	U7
01.13.0005-21	Connector	CN1,2
01.14.0010-21	Flat Cable 15 Circuits	FC1
01.14.0030-21	Flat Cable 13 Circuits	FC2
01.14.0029-21	Flat Cable 12 Circuits	FC3
01.14.0044-21	Flat Cable 16 Circuits	FC4
01.14.0043-21	Flat Cable 13 Circuits	FC5

Input Board

Code	Components	Reference
01.05.0082-20	Input Board	----------
01.01.0019-21	CD4051BE	U2,4,6,8
01.01.0026-21	AD 706 JN	U1,3,5,7

01.09.0013-21	Transistor BC 327	Q1,2,3,4,5,6,7,8
01.04.0005-21	Reference Diode LM336/5V	D1,2
01.03.0035-21	Ceramic Multilayer Capacitor 0.1µF x 63V	C1,2,3,5,7,9,11,12,13,14, 15,17,19,21,23,24,25,26, 27,29,31,33,35,36,37,38, 39,41,43,45,47,48,49
01.03.0062-21	Tantalum Capacitor 22µF x 16V	C4,6,8,10,16,18,20,22,28, 30,32,34,40,42,44,46
01.02.0010-21	Resistor 100R 1%	R30
01.02.0038-21	Resistor 1K 1%	R1,3,6,7,8,9,12,13,14,15, 18,19,20,21,24,25,26,27, 28,29
01.02.0030-21	Resistor 4K42 1%	R2,5,10,11,16, 17,22,23
01.02.0031-21	Resistor 4K99 1%	R4

I/O Terminal Board

Code	Components	Reference
01.05.0081-20	I/O Terminal Board - DMY2015	----------
01.09.0015-21	BC 337	Q1
01.02.0010-21	Resistor 100R 1%	R2,4,6,8,10,12,14,16,18, 20,22,24
01.02.0011-21	Resistor 150R 1%	R1,3,5,7,9,11,13,15,17, 19,21,23
01.13.0002-21	Terminal Block	CN1,2,3
01.13.0003-21	Board-to-board Connector	P1,2

Alarm Board

Code	Components	Reference
01.05.0052-20	Alarm Board	----------
01.01.0033-21	Optical coupler 2502	U3
01.04.0001-21	Diode 1N4002	D1
01.03.0039-21	Polyester Capacitor 0.1 µF x 250 V	C1,2
01.02.0114-21	Resistor 270R 5%	R1
01.02.0072-21	Resistor 100R 5%	R2
01.12.0001-21	Relay 24 V	K1
01.17.0004-21	Right Angle Pitch Header 2x2	CN3,4

4.7 - List of recommended spare components

Display Board
Display DP1, 2, 3, 4, 5, 6

Power Supply Board

IRF 822	Q3
UC 3842	U1
Fuse 2A	F1
LM 358N	U2

I/O Terminal Board

BC 337	U1

CPU Board

4051	U14
4053	U15

Input Board
Reference diode LM336/5V D1,2

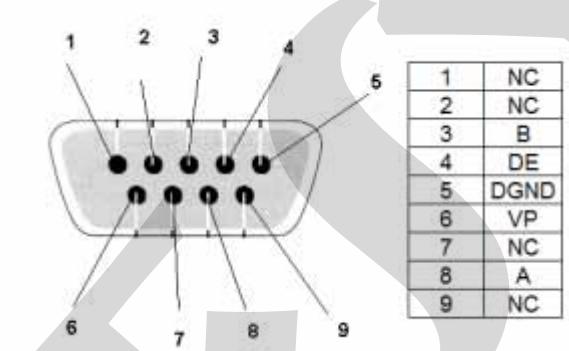
Engineering Units Label
Code 02.10.0003.21

5.0 - PROFIBUS Communication

The DMY-2015-PB-Energy has Profibus-DP serial communication, via RS-485 physical media and can be connected to networks with communication rates 9600, 19200, 45450, 93750, 187500, 500000, 1500M, 3M, 6M and 12M.

The connection can be made in two ways: DB9 connector or terminal block (see Figure 3).

The DMY-2015-PB-Energy has a female DB9 connector which must be connected to the standard Profibus connector (DB9 male). The standard Profibus DB9 connector has internal termination resistors, and can turn them on and off as needed. The DB9 connector has pin assignments according to Figure 18.



1	NC
2	NC
3	B
4	DE
5	DGND
6	VP
7	NC
8	A
9	NC

Fig.18 – DB9 Connector Pin Assignments

Furthermore, they can be directly connected to the wire pair (Terminal 25 – VP; Terminal 26 – B/B'; Terminal 27 – A/A'; Terminal 28 - DGND) from network to the I/O terminal. It is important to note that there is no internal termination resistors. Thus, it is responsibility of the user to connect termination resistors to the terminals according to Figure 19.

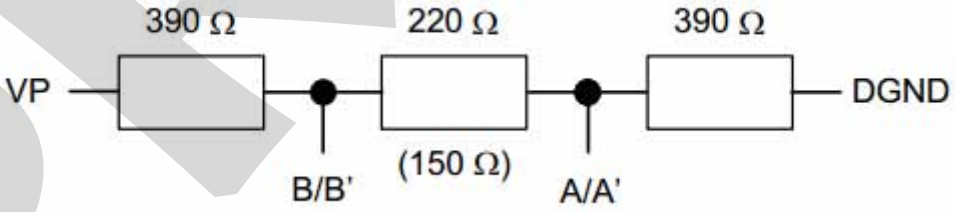


Fig.19 – Termination Resistors

After the physical connection of the instrument on the network, the configuration of the Profibus address is required. In configuration mode, selecting the PROF level has access to ADDRESS option. You must configure an address in the range 1-125.

To make the configuration of the Profibus network must use the GSD file (PRYS0E26.gsd). The modules to be inserted in the configuration of DMY-2015-PB-Energy should be:

Slot	Inputs	Outputs	Function
0	2 Bytes (1 Word)	---	CA-1
1	2 Bytes (1 Word)	---	CA-2
2	2 Bytes (1 Word)	---	CA-3
3	2 Bytes (1 Word)	---	CA-4
4	2 Bytes (1 Word)	---	CA-5
5	2 Bytes (1 Word)	---	CA-6
6	2 Bytes (1 Word)	---	CA-7
7	2 Bytes (1 Word)	---	CA-8
8	2 Bytes (1 Word)	---	State of the relays and alarm condition for each channel *
9	2 Bytes (1 Word)	---	State of the LEDs *
10	2 Bytes (1 Word)	---	Burnout channels *
11	---	2 Bytes (1 Word)	Acknowledgement of the relays and fault condition *
12	---	2 Bytes (1 Word)	Acknowledgement of the LEDs *

* More details are found below

Attention!! Any other different setting will result in incorrect operation of the instrument.

The slots 8 to 12 carry information in bit form. Each bit of this data has a distinct meaning.

	Input - 2 Bytes (1 word)															
Slot 8	*	*	*	*	*	4	3	*	8	7	6	5	4	3	2	1
	---					State of the relays[1]			alarm condition for each channel [2]							

*N/A = unused bits
1 State of bit => 1 = triggered relay; 0 = not triggered relay
2 State of bit => 1 = alarm condition achieved for the channel; 0 = no alarm condition

	Input - 2 Bytes (1 word)															
Slot 9	*	*	*	*	*	*	*	*	8	7	6	5	4	3	2	1
	---								Leds[1]							

*N/A = unused bits
[1] State of bit => 1 = led on; 0 = led off

Slot 10	Input - 2 Bytes (1 word)															
	*	*	*	*	*	*	*	*	8	7	6	5	4	3	2	1
									Burnout[1]							

*N/A = unused bits
[1] State of bit => 1 = burnout channel; 0 = channel in normal condition

Slot 11	Output - 2 Bytes (1 word)															
	*	*	*	*	*	*	*	*	*	*	4	3	*	4	3	*
	---										Relays[1]			Relays[2]		

*N/A = unused bits
[1] State of bit => 1 = fault acknowledgment
[2] State of bit => 1 = relay acknowledgment (since the latch is configured for the relay)

Slot 12	Output - 2 Bytes (1 word)															
	*	*	*	*	*	*	*	*	8	7	6	5	4	3	2	1
	---								Leds[1]							

*N/A = unused bits
[1] State of bit => 1 = led acknowledgment

In operating mode, if the Profibus master is not in data exchange the display flashes "BF" (Bus Fail) and the LED 12 remains off. When you enter the data exchange mode, the display stops blinking "BF" and the LED 12 turns on. Another way to check if the slave in question is in data exchange is to enter the setup mode, PROF level, choose STAT option. If the display shows RUN, the slave is in data exchange. Otherwise the display shows RDY.